

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
21 April 2005 (21.04.2005)

PCT

(10) International Publication Number  
**WO 2005/035455 A1**

- (51) International Patent Classification<sup>7</sup>: **C03B 37/027**, 37/018, C03C 13/04, G02B 6/00
- (74) Agents: **HAINES, Miles, John** et al.; D Young & Co, 120 Holborn, London EC1N 2DY (GB).
- (21) International Application Number:  
PCT/GB2004/004293
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (22) International Filing Date: 8 October 2004 (08.10.2004)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
0323805.2 10 October 2003 (10.10.2003) GB
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- (71) Applicant (for all designated States except US): **UNIVERSITY OF SOUTHAMPTON** [GB/GB]; Highfield, Southampton, Hampshire SO17 1BJ (GB).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **BADDING, John, V.** [GB/GB]; c/o Centre for Enterprise & Innovation, University of Southampton, Highfield, Southampton, Hampshire SO17 1BJ (GB). **HEWAK, Daniel, William** [CA/GB]; c/o Centre for Enterprise & Innovation, University Of Southampton, Highfield, Southampton, Hampshire SO17 1BJ (GB). **HUANG, Chung-Che** [CN/GB]; c/o Centre for Enterprise & Innovation, University Of Southampton, Highfield, Southampton, Hampshire SO17 1BJ (GB).
- Published:**  
— with international search report  
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: SYNTHESIS OF GERMANIUM SULPHIDE AND RELATED COMPOUNDS

(57) Abstract: The invention relates to synthesis of germanium sulphide glasses and optical devices formed therefrom. In a chemical vapour deposition process, germanium tetrachloride is reacted with hydrogen sulphide at temperatures in the range 450-700°C to form germanium sulphide. Lower temperatures within this range of 450-550°C directly produce a glass, whereas higher temperatures within the range of 600-700°C produce a crystalline powder which can then be reduced to a glass by subsequent melting and annealing. The reaction is preferably carried out at atmospheric pressure or slightly higher. Thin films and bulk glasses suitable for optical waveguides can be formed directly in one processing step as can powders and microspheres. The materials synthesised are of a high purity with low oxide impurities and only trace levels of transition metal ions.

WO 2005/035455 A1